

Prevalence of Corneal Astigmatism before Cataract Surgery in Yazd Province, Iran

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Abstract

Purpose: To analyze the prevalence and presentation patterns of corneal astigmatism in cataract surgery candidates in Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Patients and Methods: Refractive and keratometric values from 400 eyes of 365 patients were measured before surgery in patients having cataract extraction. Descriptive statistics of refractive and keratometric cylinder data were analyzed and correlated by age ranges.

Results: Our data showed that 22.8 % of patients had less than 1 D of corneal astigmatism, 12.9 % had 1 - 1.5 D, 21 % had 1.5 - 2 D and 9.3 % had more than 2 D of corneal astigmatism, so among all patients, astigmatism of 0.0 to 1.00 D was the most common cylinder value (22.8 %).

Conclusion: Our study showed that 43.2 % of preoperative cataract surgery eyes in Yazd have a corneal astigmatism of 1.0 D or more, indicating that better surgical techniques or using Toric IOLs are needed to achieve better visual rehabilitation.

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Introduction

Phacoemulsification is one of the most successfully and commonly performed cataract surgeries worldwide. Patients expect their vision to improve after cataract surgery and to be free of the cumbrance wearing of glasses and contact lenses. Because of this expectation, ophthalmologists must pay attention to the management of preoperative refractive errors especially corneal astigmatism at the time of cataract surgery ^(1,2).

Today, cataract surgery is regarded as a refractive surgery aiming to achieve pseudophakic emmetropia, which makes eliminating corneal astigmatism critical. It is important to correct pre-existing spherical errors by accurate biometry and intraocular lens (IOL) power calculation, and to manage preoperative corneal cylinder errors by a suitable method. Patients with varying degrees of corneal astigmatism can be placed into a variety of dioptric categories which dictate different approaches to surgical correction. So the most critical step is to find out the exact source, magnitude and axis of the astigmatism and to make the decision about the most appropriate technique. Also other factors need to be taken into account, such as age of the patient and the corneal characteristics of both eyes. An analysis of the distribution of corneal astigmatism among cataract candidates will provide valuable information for ophthalmologists and cataract patients ⁽³⁾.

The distribution and prevalence of corneal astigmatism in cataract patients from different countries have been previously reported ⁽⁴⁻⁶⁾. The present study reviewed a sample of the cataract patients in Shahid Sadoughi hospital, Yazd, Iran, to investigate the prevalence of corneal astigmatism before cataract surgery and to describe its distribution in different age subsets. This will provide information

regarding the most prevalent keratometric condition, so better strategies for IOL implantation might be achieved.

Patients and Methods

In this retrospective descriptive study, biometry data were collected for all patients who underwent phacoemulsification and implantation of a hydrophobic acrylic foldable intraocular lens through a temporal clear corneal incision at Shahid Sadoughi hospital in Yazd city, Iran, in year 2011. Patients with a history of ocular surgery, corneal diseases, inflammation and younger than 30 years old were excluded.

Preoperative evaluation of the cataract patients included manifest refraction, slit-lamp biomicroscopy, tonometry and fundus examination performed by an ophthalmologist. All biometry evaluations and IOL power calculations were performed at Shahid Sadoughi hospital, Yazd, Iran, by one expert optometrist.

The analysis of corneal astigmatism was performed using an auto kerato refractometer. This system performs an automatic measurement of the central keratometry of the eye (flat axis and steep axis).

To achieve a significance level of 5 % with power of 80 %, a minimum sample size of 384 eyes was required. Data were analyzed by SPSS software (Version 21. Armonk, NY: IBM Corp.), and P values less than 0.05 were considered statistically significant. The study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd Iran, and all patients gave written consent before entering the study.

Results

This study included 400 eyes from 365 patients, including 183 males and 182 females with the mean age of 69.5 years. The distribution of patients

regarding the age subgroups is shown in table 1. Table 2 presents the frequency and distribution of corneal astigmatism.

Most patients in the present study were ≥ 70 years old. In our study, 22.8 % of patients had less than 1 D of corneal astigmatism, 12.9 % had 1-1.5 D, 21 % had 1.5-2 D, and 9.3 % had more than 2 D of astigmatism, so among all patients, astigmatism of 0.0 to 1.00 D was the most common cylinder value (22.8 %), followed by 1.50 to 2.00 D (21 %) and 1.00 to 1.50 D (12.9 %). Finally, moderate astigmatism (more than 1 D) was the most common category.

Table 1: Age contribution of patients entering the study.

Discussion		
Age	Number of patients	Percent (%)
30 - 50	13	3.3
51 - 70	170	42.5
> 71	217	54.3

Table 2: The frequency and distribution of corneal astigmatism among patients entering the study.

Astigmatism	Number of patients	Percent (%)
0	136	34
≤ 1	91	22.8
1.0 - 1.50	84	21
1.50 - 2.00	52	12.9
> 2	37	9.3

Table 3 presents the mean astigmatism values in 3 age subgroups. The number of eyes in the 3 age subgroups was as follows: 50 years or younger 13 eyes; 51 to 70 years 170 eyes; more than 71 years 217 eyes. Refractive values showed no significant difference between age groups.

Table 3: The mean astigmatism values in 3 age subgroups among patients entering the study.

Age	Mean astigmatism	Standard deviation
30 - 50	1.46	1.72
50 - 70	0.77	1.17
≥ 70	0.94	1.08

Discussion

The results revealed that a large proportion of eyes (43.2 %) had corneal astigmatism of 1.0 D or greater, which is somehow higher than the results reported by some previous studies like a Chinese cohort study ⁽¹⁾. In that study corneal astigmatism was between 0.25 D and 1.25 D in 67.7 % of eyes, 1.25 D or higher in 27.5 % eyes, and less than 0.25 D in 4.8 % of the eyes ⁽¹⁾. Also Abdur Rashid et al., have reported that astigmatism of more than 1 D was present in 30.4 % of their cataract surgery candidates ⁽⁵⁾. Another report by Ferrer-Blasco et al., indicated that 22.2 % of their cataract surgery candidates had astigmatism of 1.50 D or higher ⁽⁶⁾. Our results are comparable with some studies that have reported higher astigmatism among candidates of cataract surgery, such a study in Northern China by Yuan et al., who reported corneal astigmatism of 0.5 D or less in 20.76 % of eyes, 1.0 D or more in 47.27 % of eyes, 2.0 D or more in 13.16 % of eyes, and 3.0 D or more in 3.75 % of eyes ⁽³⁾. Also Khan et al, have reported that of patients attending for routine cataract surgery at a teaching hospital in the United Kingdom, 40.41 % had more than 1.00 D of astigmatism ⁽⁷⁾.

Creating a clear corneal phacoemulsification incision on the steep axis of astigmatism can help to reduce the astigmatism along that axis.

This approach is usually sufficient for most eyes. However, a small incision can correct only astigmatism of up to 1 D. Limbal relaxing incisions can be used to treat 1 - 3 D of corneal astigmatism. Complications include incision gape, patient discomfort, inadvertent corneal perforation and neurotrophic keratopathy. These methods are a judicious option in markets where toric IOLs are unavailable and in eyes with up to 3.0 D of pre-existing corneal astigmatism not correctable by a Toric IOL. For higher orders of astigmatism, a combination of clear corneal and limbal relaxing incisions may be used. The length, depth, and placement of these incisions, as well as the age of the patient, will all affect the outcome of these procedures. Toric IOL (T-IOL) implantation offers the possibility of correcting both spherical equivalent refraction and the astigmatism during cataract surgery. Other advantages including being predictable and reliable, correction of moderate to high astigmatism and requiring no new skills for the surgeon makes using Toric IOLs a popular technique ⁽⁸⁻¹⁰⁾.

In our study, 22.8 % of eyes had a corneal astigmatism of 1.0 D or less when sufficient correction was achieved through on axis clear corneal incision. Also 43.2 % of cases had more than 1 D of astigmatism that needed other techniques such Toric IOL implantation for correction.

With an aging population and a higher demand for improved vision, the need for astigmatism correction with Toric IOLs or other methods will increase accordingly. Toric IOLs have been used clinically since they were first described by Shimizu et al., ⁽¹¹⁾. At present, Toric IOLs can be used to correct corneal astigmatism from 0.4 D to 8.4 D during cataract surgery ⁽⁶⁾. In our study, more

than 1 D of astigmatism was present in 43.2 % of all cases, most of which could be effectively corrected with Toric IOLs. The higher cost of new IOLs may be a burden for patients and health insurance companies.

Conclusion

Our study showed that 43.2 % of preoperative cataract surgery eyes in Yazd have a corneal astigmatism of 1.0 D or more, indicating that better surgical techniques or using Toric IOLs are needed to achieve better visual rehabilitation.

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Footnotes and Financial Disclosures

Conflict of Interest:

The authors declare no conflict of interest with the subject matter of the present manuscript.